The Province of Alberta

PETROLEUM AND NATURAL GAS CONSERVATION BOARD

IN THE MATTER OF THE GAS RESOURCES PRESERVATION ACT

AND IN THE MATTER of a Joint Hearing to determine various questions relating to the proposed Export of Natural Gas from the Province of Alberta.

I. N. McKinnon Esq., Chairman

D. P. Goodall Esq.

Dr. G. W. Govier

Session: September 26th, 1951.

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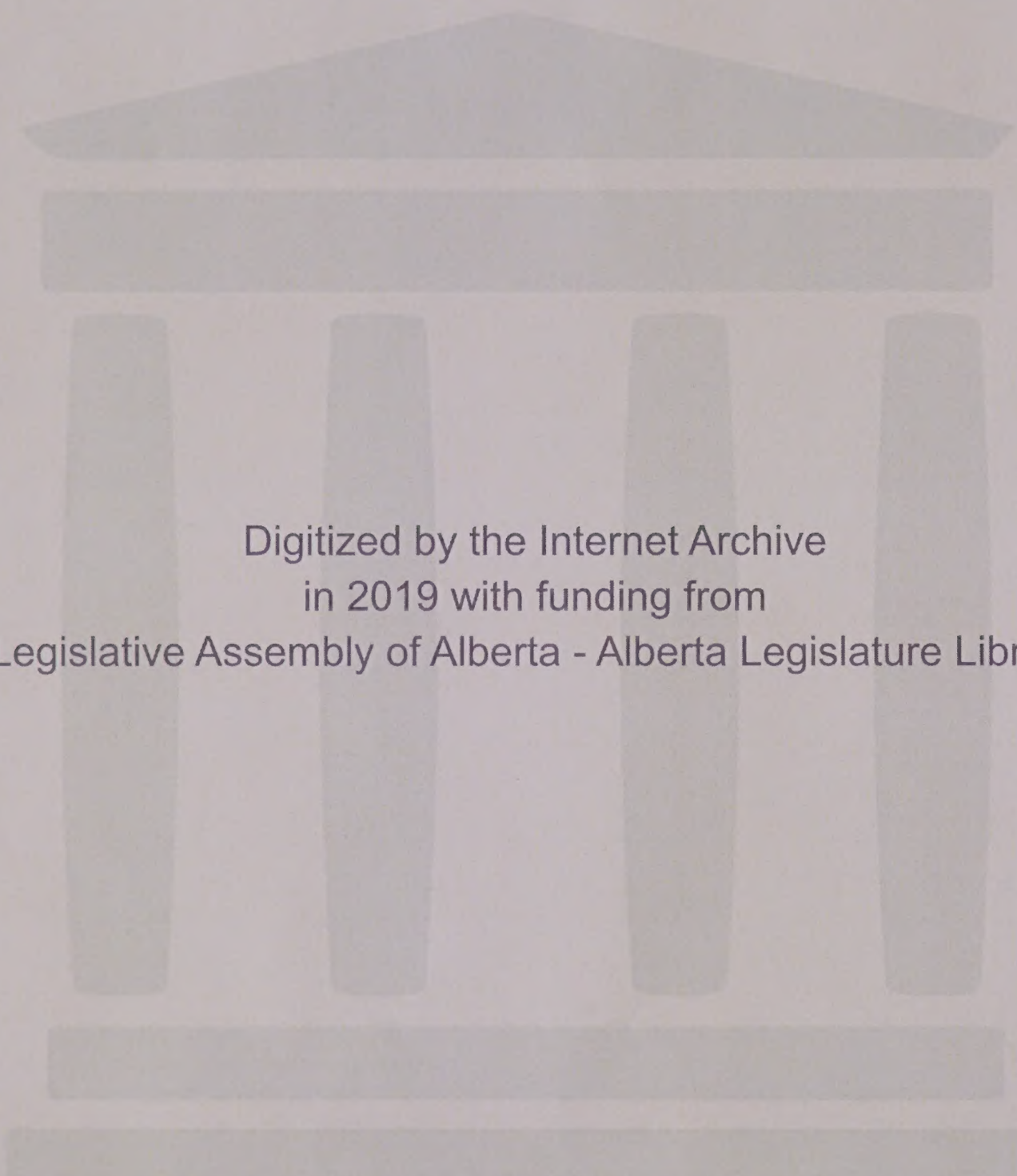

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THE CHAIRMAN: All right, Mr. Porter.

MR.PORTER: I am calling Mr. Hu Harries who will submit a brief on the needs of the Province of Alberta.

THE CHAIRMAN: That brief will be marked Exhibit 26, Mr. Howard.

STUDY OF NATURAL GAS REQUIREMENTS FOR THE PROVINCE OF ALBERTA, 1951 TO 1980 PREPARED BY MR. HARRIES, MARKED EXHIBIT 26.

.....

HU HARRIES, having been first duly sworn, examined by Mr. Porter, testified as follows:

Q Mr.Harries, perhaps before you proceed to the Study you might tell us something about yourself so that the Board will have some understanding of your competence to make this study?

MR. S. B. SMITH: Mr. Porter, I am quite prepared to concede Mr. Harries' qualifications.

MR. C. E. SMITH: You are talking about bread, aren't you?

THE CHAIRMAN: The Board knows Mr. Harries, Mr. Porter; unless you want it for the record, I do not think you need to go into it.

MR.PORTER: Very well. I do not think there is any appeal from the record.

Q Go ahead, Mr. Harries?

A The purpose of this study is to inquire into the natural

gas requirements of the Province of Alberta for the thirty-year period ending 1980. The basic assumption of this study is that future Provincial requirements for natural gas can be estimated most accurately by relating the material resources and the human resources of a particular area to one another in terms of the expected growth in each of them. This involved something more than an extrapolation of the observed trends of growth over the Province as a whole and dictates an examination of specific resources as their future development may interact with a variety of institutional and locational factors. It presupposes a knowledge of the present geographic and economic position of the Province of Alberta.

A convenient division of the Province into relatively homogeneous geographic areas is provided by the 16 Census Divisions. The Census Division is, therefore, the basic unit in this study. Where further refinement is required, the 947 Census Sub-Divisions have been used.

For analytical purposes the future natural gas requirements of Alberta have been divided into categories. The most important category, in terms of volume, is the Urban Domestic and Urban Commercial segment which composes the non-industrial gas requirements of all the communities in Alberta with a 1946 population in excess of 300 persons. The estimates for this category are to be found on pages 16 to 31 of this report. These estimates were made by Census Divisions in the manner described in the following

paragraphs.

And as I describe the procedure it may be useful to refer to page 16 where we set out the urban non-industrial natural gas requirements of Census Division 1.

Initially, it was determined whether the community is served with natural gas. If it is served by either the Canadian Western Natural Gas Company or Northwest Utilities Limited, that fact was designated by the letters "UP" beside the name of the community.

Thus we have in Census Division 1, at Bow Island, it is presently served by Canadian Western and Taber is presently served by Canadian Western.

If it is presently served by a local utility system, that is indicated by the presence of the letters "LP". As, for example, in Census Division 1, Medicine Hat served by a local utility system. The location of each community not served with natural gas was examined, and if it appeared that the logical future service would come from an extension of the lines of one of the major utilities, it was designated by the letters "UF". We have not got a "UF" in Census Division 1, but turning to Census Division 2, on page 17, we find that Cardston, Magrath and Raymond are designated "UF", which indicates that an extension of present Canadian Western lines to those three places appears to be a distinct possibility.

If local service seemed appropriate

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for the future, the community name was followed by the letters "LF". When we designate a town with the letters "LF" that indicates that we thought a service in the future from a local utility would be appropriate. That does not necessarily mean that it would not, in fact, be one of the major utilities who would extend the service to that community. It may well be that you would have a system which was self-maintained, as it were, for that community. That is not unlike the situation that we have had for a number of years with Brooks, but in order to indicate the division of requirements, we thought it useful to categorize future community requirements by these designations.

It also, I think, will become apparent after the 16 Census Division requirements have been considered, that some of these communities could only be served by local sources of natural gas or from a line joining one of the major export transmission lines in the Province, and we designated those possibilities also as "LF", for example, Blairmore in Census Division 2, that community might conceivably be served by an export line that was going out of the Province through the Crow, or it may, alternately, be served by a local supply of gas in the immediate vicinity of the town.

The procedure there is apparent from the first part of the data, using Census Division No. 1, for example, again, where we find that Medicine Hat, for example, has increased in population from 1911 to

1946 on the order of 7251 persons, with the total change from 1941 to 1946 of 2288, which gave us an average change from 1911 to 1946 of 207, the average annual change, and the average annual change from 1941 to 1946 was 458 persons, approximately.

Now, we then took a look at the location of the community and considered a variety of factors which might influence the growth of that particular community. For example, the presence of agricultural land that would be open to settlement in the immediate vicinity of the community, or the probability of the extension of irrigation, also the availability of transport, and we put particular emphasis on the presence of both the major railway companies operating to that community. That is, we felt that a community which had only the C.P.R., or only the C.N.R., was probably not as favourably situated as a community which was served with both lines. We also gave some consideration to the availability of water in the immediate vicinity of the community, the climate, and the nearness to developed or undeveloped natural resources, and also what we have termed the sociological aspects of community life.

There are some communities, and I think that Cardston would probably be a good example, while the gross there would be conditioned by economic factors, but it will also probably be conditioned by sociological factors, due to the fact that it is the centre of community life for the Mormon settlement down in Southern Alberta, and that is going to have, we think, some effect on the growth of the population in that community. We also looked at the reports of the Department

of Economic Affairs, and these reports presume to deal with the economic possibilities of the city, and we felt that that might provide some basis for intelligent appraisal of the possibilities of the particular community.

I do not think there are any comments I can usefully make on the other subdivisions, the other Census Divisions, with regard to the population growth that we have estimated except to say this, that in the Northern Census Divisions,that is, primarily 14, 15 and 16, there is a great deal of presently undeveloped agricultural land up there, and it would appear to us that over the next 30 years there will be new communities established there, and in order to give some effect to that supposition, we increased the present community population by what may be a rather general figure to compensate for the fact that there will be an increase in the urban population, which might not necessarily be reflected in the growth of the communities as they are presently established.

Q Do you mean urban or rural?

A Urban that will go as the result, the urban communities will go as the result of the urban development, or the rural . . .

Q Yes?

A . . . development in that area.

Q MR. C. E. SMITH: What about deaths due to slippery streets, do they consider that, Mr. Harries?

A Calgary's population has grown, sir, but it may have been one of the factors. Having established population trends, and I may say, incidentally, that we have estimated the

1951 population from the 1946 census data. There are no statistics for 1950 with regard to the urban population, or 1951, which we felt we could rely on to give us an official figure. There are, in the larger cities, annual census-takings of population done by the civic officials themselves, but those, in considering them in comparison with the Dominion figures of the census, they tend to over-estimate the population, because they are done on a slightly different basis than the Dominion census, and we felt that it would probably be better to estimate the population for 1951 rather than to use those figures which we thought would rather over-estimate the total.

The natural gas requirements of these communities were estimated by applying consumption factors of varying weights to the ascertained population figures. These factors were derived from an analysis of the per capita consumption of natural gas by domestic and commercial users in those areas of Alberta served by natural gas in past years. What we did was to assume that there will be a slight increase to the number of customers per thousand in Calgary between now and 1961, and that is reflected by this increase of 2 Mcf in population. For Lethbridge we used the 1951 figure of 74 Mcf per capita per annum, which increased to 76 Mcf by 1961. Medicine Hat was presumed to use more gas per capita in 1951 than in 1961, with the average decreasing from 100 Mcf to 95 Mcf between those years. The difficulty with regard to estimating the per capita use for Medicine Hat was the fact that the statistics which are available were, in

the words of the witnesses who used them before the Dinning Commission, not an actual measurement of gas which goes into the commercial and domestic use in Medicine Hat, and there was estimated an error, I believe, of 13%, that is, under-estimating the total consumption by 13%, and that gave us a per capita figure of very close to 100. This is out of line with Calgary and Lethbridge, and we felt that that might be due to other cost factors in the Medicine Hat situation, or to an actual deficiency in the statistics we were using, and we felt that by 1961 that probably both of those factors would have altered to the extent that 95 Mcf would be a realistic figure to use.

(Go to page 864)

A There has been a tremendous increase in the per capita consumption in Edmonton over the past 10 years. We felt that the expansion in that regard was drawing to a close and consequently increased per capita use by three during the next 10 years.

For the other urban communities in the Province, a division was made between Census Divisions 1 to 6 inclusive and the remaining Census Divisions. The former were estimated to use 100 Mcf. per capita per annum in 1951. This increases to 104 Mcf. per capita per annum by 1961. It was estimated that the communities in Census Divisions 7 to 16 inclusive used 111 Mcf. per capita per annum in 1951. This increases to 115 Mcf. per capita per annum by 1961.

The divisions between Census Divisions 1 to 6 and the others was made because of differing climatic factors north and south. That seemed to be a reasonable place to make it.

Q MR. C.E. SMITH: Show us the line on that big map where they separate.

A It runs right south of Red Deer, right through here (indicating).

Q Thank you.

A The variation that is present in these estimates reflects significant differences in climate, housing, availability and efficiency. The total requirements for the Urban Domestic and Urban Commercial category are subdivided on the basis of the type of service assumed for each community. An additional

assumption is that all of these communities will be receiving natural gas service by 1961. Table 1 summarizes the yearly requirements for this group from 1951 to 1980.

One indication of the difference in climate is measured by the day degrees that you find, the variation in day degrees that you find in the four reported areas for which there are statistics published in the Canada Year Book. Differences in housing, that is, in the urban centres you have more persons per square foot than you have in the rural areas. We also felt that the efficiency of your gas use would be better in the urban areas than in the non-urban, or in the cities and the other urban areas, because of the fact that you have more people living in apartments and so on where you get a better use of the gas. The availability and efficiency of use also entered into those calculations. The total requirements for the urban domestic and urban commercial category are subdivided on the basis of the type of service assumed for each community. That relates back to the UF and LF designation. An additional assumption is that all of these communities will be receiving natural gas service by 1961. What we did was added the load gradually until 1961 and had them all tied in. Table 1 summarizes the yearly requirements for this group from 1951 to 1980. There we find that the total requirements from 1951 to 1980 for the Province is 1513 billion, and that divided between the three suppliers, Canadian Western, Northwestern Utilities and the local systems in the order of 512 billion for Canadian Western, 677 billion for North-

western and 324 billion for the local systems.

In addition to the persons living in what have been termed herein "urban areas", a significant percentage of the population live in villages, hamlets and other unincorporated communities, either in isolation or on the fringe of urban centers. In Census terms these, for the most part, are the Rural Non Farm population. No useful purpose would be served by estimating the natural gas requirements of this category by Census Divisions so their needs have been calculated on a Provincial basis. Table 2 details these requirements by potential supplier. That is, non-urban areas in our classification would be those with a population in 1946 of less than 300, and also for changes in the total number of rural non-farm population in the Province.

The basis upon which the requirements in Table 2 were derived is this. The 1951 Non Urban population of Alberta was estimated upon the basis of its past percentage relation to the Urban population. This trend was carried through for the years 1961 and 1981 allowing for the tendency of present Non Urban areas to become Urban and for changes in the Rural Non Farm population. The areas of the present Non Urban population concentrations were also noted.

The total Non Urban requirements for 1951 were estimated by using a per capita figure of 10 Mcf. for the two major utilities and a per capita figure of 2 Mcf. for the local systems. These requirements were based upon an analysis of the deliveries of Northwestern

Utilities in the year 1950 and a study of the area served by Canadian Western. When we looked at the deliveries of Northwestern in 1950 we find there are deliveries to places like Blackfalds which would not be reflected in our urban requirements because it was less than 300, yet those places in total would use some considerable amount of gas, so that by taking the distribution there and also by considering institutions which might be located outside of the borders of the towns, an example there would be the college at Lacombe which is outside of the borders of the town and the use in a place like that would not be reflected in the population per capita figures that we use. We felt that by allowing 10 per cent per capita we were adequately covering the requirements of those non urban segments. As far as the non urban requirements of the local systems were concerned, we kept that at 2 because we thought that would be adequate in view of the fact that local systems do not have lines running by smaller communities. Their total requirements would be reflected in the population figures of the community which they serve to an extent that the major utility requirements would not be. For 1961 the per capita requirements were increased to 12 Mcf. and 5 Mcf. respectively, primarily because a growth in the Non Urban -- Rural Non Farm category is contemplated. The increase of 2 for the major utilities and the increase of 3 for the local systems simply reflects the fact that some of the communities which we have termed Non Urban will in fact be Urban sometime. Some are urban now and others of

them will become urban by 1961, and to reflect that we increased the per capita requirements.

Q MR. C.E. SMITH: Did you get your 2 and 3 mixed up there, Mr. Harries?

A No, the Non Urban utility requirement and the Non Urban local requirements are increased by 3, the difference between 10 and 12 and 2 and 5.

The natural gas requirements of Alberta's farm population are next considered. This requirement only contemplates the use of natural gas to generate electrical power for farm use because it will not be possible to take natural gas by pipeline to a good many rural homes.

The present and proposed distribution of electricity to the farmers of Alberta is illustrated by the attached sketch map of present and proposed rural electrification development.

Q MR. C.E. SMITH: Just a moment. Will this map become part of Exhibit 26?

THE CHAIRMAN: I think it should be part of Exhibit 26. It is mentioned here.

A This map indicates that only a relatively small part of rural Alberta will receive the benefits of electrification under the present plan. Out of a total of 90,000 farms in Alberta, less than 30,000 farms will be receiving power in 1958. In other words, less than 35 per cent of the rural homes of Alberta can anticipate electrical service.

The use of local generating plants dependent upon natural gas for fuel could completely change this

picture by making power available to the farms of the eastern, north-eastern and northern parts of the Province. These are the areas remote from hydro power sources. Steam plants, or gas diesel plants, or gas turbine plants, operating from supplies of natural gas found within the farming community could bring the benefits of electricity to large numbers of Alberta farms where the need is great. I think the map itself shows the situation as clearly as it could be put. The fact is that under the present scheme we have got roughly the eastern third of Alberta and all the northern area including the Peace River block where there will be no electrical power distribution, and these, of course, are the areas that lie furthest from the Bow River area where the power is presently, where the majority of the power is presently generated.

In order to estimate the future gas requirements of this type of use, the present and future trends of agricultural activity in each of the Census Sub-Divisions has been studied. The basic data is the 1946 Census Report on Agriculture. From this Report the number of farms and their size and distribution in the Sub-Divisions together with their productivity, their population and their general economic characteristics were tabulated. An analysis was made of the soil and climatic conditions, the trends in land use, the projected settlement (either through the introduction of irrigation or the opening of land previously closed to settlement) and a variety of other general development factors.

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Now, what we did in arriving at those figures, I think by reference to page 33 where we deal with Census Division 1, will help me to make this explanation. We took a look at each of the Census Sub-Divisions in Census Division 1 and tabulated the farm population in the sub-Census division and the number of farms in 1946. We took from the number of farms that were listed in 1946, those farms which we felt were subsistence farms and we varied the gross income requirements of each Census Division to arrive at what we termed a subsistence farm, but in general if there was a gross income of less than $600.00 from the farm enterprize in 1946 we concluded that that was a subsistence farm and we added a number of subsistence farms we found in this Census Sub-Division and took them from the number of farms operated in 1946. Then to that figure we added a figure which indicated the number of farms which we expected to be added to the Sub-Census Division by 1961. And taking a look at Sub-Census Division 33 and Census Division 1 we find that in 1946 there were 136 farms and that by 1961 we expected 207 farm units. The increase there is accounted for by the fact that there will be irrigation in that Sub-Census Division 33 by 1961, and we presumed that the typical farm in that area would vary from a quarter section to a half section under irrigation, and calculated the number of acres available for irrigation in that particular Census Sub-Division and divided it out by the number of acres per farm to give us the farm figures. We then tempered the number of farms figure in 1961 by

a figure for the number of subsistence farms which would still remain there in 1961 to give us what we call the number of farm units, which is distinct from the number of farms because of the fact that the subsistence farms and unoccupied farms would be included in a total farm figure, whereas they are not included in the farm unit figure.

Then when we got up to the northern part of the Province we studied the reports of the Provincial Government dealing with areas available for settlement in those northern Census Divisions and calculated the number of farms on the assumption the typical farm up there would be from a half to three-quarters of a section, and we used only those lands which had been surveyed and were recommended for settlement in the report of the Provincial Government to get a figure for our total farm units in 1961. In some of the Census Divisions the number of farm units in 1961 is less than the number of farms in 1946, and that happens because we felt that the trend has been to larger and larger farm units. We saw no reason to suppose that the trend would not continue, and in the absence of land which is presently occupied but not cultivated or in the absence of unoccupied land in the Census Division, we felt that there would be a fewer number of farm units in 1961 than there were in 1946. That factor was reflected in a decreased number of farm units in 1961 in the Census Division or the Sub-Census Division as the case may be. And we also made an allowance for the fact that what the Census calls a farm

is not a farm in all cases from a practical standpoint. The Census Division under farm is all the land located in one municipality or sub-division which is directly farmed by one person conducting agricultural operations either by his own labour or with the assistance of members of his household. It may consist of a single tract of land or a number of separate tracts held under different tenures. It must be under one acre in size with 1945 agricultural production of $50.00, or be under crop or be employed for pasture in 1946. So that theoretically you could have a farm for Census Division purposes which was one acre in size provided it had over $50.00.

Q MR. C.E. SMITH: If you are quoting from something, would you give us the reference?

A This is a note that I had taken from the Census Report which defines a farm definition that they used. I will get you the exact quote on it if you wish.

This is an estimate of the number of farms in each Census Sub-Division in 1961. An allowance has been made for what might, on a Census definition, be called a "farm" but which is not a functioning unit for practical purposes.

The location of the Farm Units was then examined with reference to existing or proposed rural electrification schemes. Those farms which are served or could be served from these facilities were deducted from the total number to give the Potential Power Users. That is found in the 5th column in the Rural Electrification Natural Gas Requirements table.

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In 1961 there will be 86,233 farms in Alberta. There will be 57,212 farms without electricity under the existing rural electrification plans.

The natural gas requirements of the potential power users have been calculated on the assumption that each farm will require 2500 KW Hrs. of electricity per annum. This is almost double the present annual use of the farms now connected in Alberta. It is well above the average farm consumption in Canada.

We assumed that 30 cubic feet of natural gas are used to generate each KW Hr. of electricity. This requirement presupposes a most inefficient means of generating electricity from gas and consequently increases the natural gas requirement. It is not possible to forecast the technological progress which will be made in generating equipment but modern steam plants use less than 20 Mcf per KW Hr. and the gas turbine engine could substantially reduce this figure.

The natural gas requirements for rural electrification are detailed at pages 32 to 48 of this report. A summary of these requirements is given in Table 3 on page 10.

Table 3 indicates that the total natural gas requirements for rural electrification over the 30-year period from 1951 to 1980 would amount to 111 billion cubic feet. In connection with the requirements for rural electrification we also considered the possibility of using electricity generated by natural gas to lift water in connection with the proposed and the

presently operating irrigation schemes, because if you look at an irrigation area such as the Eastern Irrigation District you find there is a large percentage of the land which is not irrigated, something on the order of 50%, and some of that land is not irrigated because it lies above the ditch where you are relying on the gravity for your irrigation. We found, however, that in the irrigation districts which are presently operating there is, in most instances, a shortage of water and that the conditioning factor is that shortage of water rather than inability to get it on to the land. In some of the proposed areas, particularly the Red Deer scheme, there is provision made for lifting the water at particular points to increase the irrigable acreage, and there the plan as presently proposed takes account of the requirements and into account the electrical limits which the water lift would require by relating to power generated in the dam itself, so that it is conceivable that if the canals were lined, and there was a definite attempt to make a more efficient use of the water in the present irrigation scheme, there could be some electrical requirement in that regard. We felt that we have allowed a leeway enough in these figures to take account of that requirement, should it arise, and that the water could be lifted by electricity generated by gas, and the total gas requirement would not be greater than what we have allowed for those areas.

The industrial natural gas requirements make up the fourth category used in estimating the total future needs of the Province. For convenience the

industrial requirements have been calculated in three groups.

The first of these groups comprises the Ordinary Industrial Requirements, which are those requirements directly linked with urban population growth. Such enterprises as restaurants, laundries, small food processors and the like make up the bulk of this group. Although there is some variability in the relationship between the Ordinary Industrial Requirements and the population of a particular community, it appears from an analysis of past consumption that 10 Mcf per capita per year is a reasonable figure to use in building a total demand.

Table 4 indicates the Provincial requirements on this basis. So that Table 4 is directly related to the population growth.

A second major industrial use of natural gas is in the generation of electrical power. The future needs of Alberta were calculated and allocated between suppliers on the basis of the present distribution as that will be modified by conversions and new installations. It did not appear practical to use a specific per capita figure and it was assumed that no hydro power would be generated outside of the Bow River area.

The natural gas requirements for this use are detailed in Table 5.

The requirements for Canadian Western, 1951, of 2.2 billion is taken from or on a

consideration of the figures that have been detailed before the Board by Canadian Western and Northwestern Utilities, which take into account the Institute of Technology, the Sanitorium here, the City Power Plant, and with regard to Northwestern Utilities, it is primarily over the City of Edmonton, but it also included the Ponoka load and, in the following years, Fort Saskatchewan will be added.

The local systems were almost exclusively Medicine Hat and Vermilion, although there was added a small amount for Northland Utilities, which were using gas in Diesel engines to generate electricity.

The Major Industrial Requirements for natural gas make up the third group. Included in this are the petro-chemical industries and the large industrial users.

These estimates were prepared for 1951, 1961, and 1981, and the figures for intervening years were calculated from these.

Now, there is some difficulty in using the three years as we have been doing in deciding what kind of a growth you have between those years. We use a constant increment because we felt no matter what type of growth you used you were not going to make allowance for the impact of the particular requirements in the year in which it occurred, unless it was almost sheer luck. That is, you cannot tell that in 1955 a particular electrical plant may go into gas use, because if it was sizeable it would be on a vertical line, so that your requirements may go up by steps, or to smooth it out you may use an inverted

curve, or a curve the other way, but once you change from a straight line addition, a constant addition, you get into the consideration of just when these particular things are going to happen in a precise year. We felt that it was just as valid to our increment, just as valid to use a constant increment between these years as to assume either one type of curve or a step up. The figures for 1951 are for the Major Industrial Requirements.

The figures for 1951 reflect current use while the figures for future years are based upon an extension of the pattern of this current use but they also look to a substantial degree of industrialization in the Province. The nature of this industrialization will be determined by a variety of circumstances, any one of which may in particular cases be of importance. The existence of a steel shortage for the next ten years, or a substantial increase in the domestic demand for rubber, or a serious decline in building activity, could all have very differing effects upon the development of Alberta industry. Premised upon a "full employment" economy, however, it appears reasonable to suppose that the basic resources of agriculture, forestry, petroleum and some branches of mining, will expand rapidly.

One of the factors which will exert an important effect upon the industrial growth of Alberta is the freight rate structure. The alterations in the basic pattern of railway rate making procedures which are presently being made as a result of the recommend-

ations of the 1950 Royal Commission on Transportation should be of substantial benefit to Alberta. Industry which has been hitherto discouraged by the relative freight rate cost of doing business in Alberta, may be able to look forward to a better rate and a better relationship. And this is going to have an effect upon the degree of industrialization in Alberta.

The estimates for 1961 for the two major utility systems have been made on the assumption that they will service the major part of the industrial expansion but not the major gas users. The growth in requirements for Canadian Western is roughly proportional to the population increases of the areas served. Northwestern Utilities requirements increase proportionately more than the population served by the system. And we made that distinction between Northwestern and Canadian Western because Canadian Western has quite a head start over Northwestern Utilities system right today because of the Nitrogen Plant, primarily.

The 1961 estimates for Local Systems were made by adding to the 1951 use, a proportionate increase for population changes and an additional amount which represented the requirements of the petro-chemical industry and a number of smaller industries which have a relatively high fuel requirement.

There is a great deal of difficulty in forecasting Industrial natural gas requirements, but the basis on which we did it was to extend the Canadian Western

and the natural gas requirements of the Northwestern on the basis of their present use and allowing for an increase on the order of 50% in each of them by 1961, then permitting roughly 25% increase in Canadian Western by 1980, and roughly 100% increase in Northwestern Utilities by 1981. Then for the local systems, the 2.5 figure is primarily Medicine Hat and Redcliff, and we increased that to 4.3 approximately by 1961, and that would be the growth of the Industrial requirements exclusive of any new uses which may come from the establishment of large industrial concerns. Looking at the large industrial concerns we simply assume that by 1960 there should be provision made for two large users of gas, and we set the large users of gas at 10 billion per year. We allowed for two plants using 10 billion a year by 1961 and for 5 plants using something on the order of 1 billion feet per year. Otherwise it seemed reasonable to suppose that there would probably be another cement plant sometime within the next 10 years added to Alberta industrialization, and there would probably be a pulp plant which would require gas, and industrialization of that magnitude we thought would be taken care of this requirement of 25 billion in 1961. Then we assume from 1961 to 1980 there would be an additional increase of 10 billion cubic feet required, and that could either be in the form of one large user or a number of smaller ones. We thought it probably more realistic to look to the establishment of an additional large user, and the small users would be taken care of, that is, the relatively small users would be taken care of in the increases that we have made in the allowance for gas in the

Northwestern Utilities system of something on the order there of 3 billion by 1980 and in the Canadian Western where the requirement is something on the order of 2 billion.

We have summarized the total natural gas requirements in Table 7 and Table 8, which is simply a compilation of the requirements that we previously discussed.

In Table 7 on page 15B, as allocated, the requirements as allocated between distributors are listed, and in Table 8 the requirements allocated between types of requirements are given. The total requirement that we arrived at for the 30-year period was 3,358 billion cubic feet.

Q MR. PORTER: There are just a couple of points, Mr. Harries, I would like you to elaborate on a little with me. Thinking first of this freight rate adjustment, it is my understanding that you are quite familiar with that having been professionally engaged in the inquiry from which it resulted?

A Yes, sir.

Q Now, in the course of your study, is it true that you found a lot of bulk commodities capable of being made in the West that could not find their way to market because of freight?

A Yes, we found that the market for Alberta products, products which could be made in Alberta, the market was restricted because of the high freight cost.

Q Yes?

A You have got the situation, although the high freight costs acted as a tariff protecting your local market . . .

Q Yes?

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A . . . your local market in itself was not big enough to permit economic manufacture, so that whereas we were in a sense helped by the high freight rate structure, because we had a protected market, we were, in fact, helped to poverty because we could not use the protected market.

Q But it is contemplated that if the recommendation of the Royal Commission is adopted that two things will happen, as I understand it, (1) that a very substantial bonus will be made towards the cost of hauling freight across Northern Ontario and (2) that equalization removing some of the existing anomalies will be applied to the rates in the West, am I right?

A Yes.

MR. C. E. SMITH: Answer "Yes". That is the best bit of evidence I have heard counsel give yet.

MR. PORTER: Well, now, I can take up a lot of time examining this witness with regard to it.

MR. C. E. SMITH: You certainly can.

MR. PORTER: If you want me to. I am trying to assist Mr. Harries in getting his statement before the Board. If there is any objection I know how to do it the other way. And the object I have in mind, sir, is in keeping with the submission that Mr. Harries has made, and I think it has been suggested that perhaps we should at least hope we can make more things industrially in Alberta and, therefore, use some more gas.

Q Now, the other thing that I want to ask you about is this: In making these estimates did you take outside figures for each use, that is, do they contemplate maximum use within

the category?

A Yes, I believe each one of the figures we have detailed are the contemplated maximum use.

Q Would you describe them as generous?

A I think both the population estimates and the use estimates are generous.

Q Thank you.

CROSS-EXAMINATION BY MR. S. B. SMITH:

Q I take it that you have some familiarity with the by-products which are produced or have been produced with the development of natural gas in Alberta, such as natural gasoline, butane, propane and sulphur?

A Well, I hesitate to say that I have anything but a very general knowledge of that, sir.

Q Now, do you know, for instance, that those products would be produced with the development of Pincher Creek, for instance?

A Yes, I read that in the transcript.

Q If Pincher Creek is developed and used?

A Yes.

Q You do not get those by-products with Pincher Creek lying there unused?

A No, that is true.

Q Would the production of sulphur, butane, propane and natural gasoline from natural gas assist in the economic development of Alberta in any way?

A I believe it would, yes.

Q Substantially?

A It could be substantially, yes, sir.

Q Perhaps very substantially?

A Depending on what attraction there was for its use, yes, it could be, sir.

Q There is an attraction for the use of all those products, natural gas and butane particularly, isn't there, or are you familiar with it?

A I think there could be, yes.

Q Butane is the base for chemical manufacture of very many important industrial products?

A Yes, that seems to be the view of the Alberta Research Bureau.

Q Are you in agreement?

A With my meager knowledge, yes.

Q Have you any view as to whether the export of natural gas from an economic point of view would tend to increase the search for natural gas in Alberta? Perhaps that lies beyond your field.

A I think it does, yes.

Q Would you care to express an opinion as to whether the export of natural gas would assist in the increase of production of sulphur, butane, propane and natural gasoline in Alberta?

A On the assumption that a field like Pincher Creek won't be developed unless there is export, that you do not get sulphur and so on from that field unless the gas is produced, or then production of the gas brings sulphur and if export is necessary for production, then I agree with the statement, sir, yes.

H. Harries,
Cr. Ex. by Mr. Steer.
Cr. Ex. by Mr. McDonald.

CROSS-EXAMINATION BY MR. STEER:

Q Mr. Harries, these Census Divisions you talk about are not the DeGolyer and McNaughton Census Divisions?

A Dominion Government.

Q Now then, you told Mr. Porter that your figures were on the generous side?

A I believe them to be that, yes.

Q And that being so, I suppose your margin of error might be what, 5 per cent, 10 per cent, in making these calculations?

A I would not want to put a percentage error on it, sir. I think we are generous.

Q They could be 5 per cent or 10 per cent above actual experience over the 30-year period?

A Oh, yes, very well, sir.

Q Because I point out to you that the difference between your figures and the Board's is, as I estimate them, just about 7½ per cent.

A Yes, sir, that is about the order.

CROSS-EXAMINATION BY MR. McDONALD:

Q Mr Harries, if I might question you with regard to how generous you have been. Are you familiar with Exhibit 96 in the Westcoast Transmission transcript filed by Mr. Brownie of the Gas Company?

A Not by the name, sir.

Q That was the one in which he has a statement attached in which there are population, customers and sales forecasts up to the year 1960?

A Yes, sir, I remember that.

Q Taking the domestic, he sets out the average number of customers in 1948, 31,000; sales per.customer 215 Mcf.; then the actual is a revised estimate for 1960, average number of customers 45,000; population 173,000; sales per customer 210 Mcf.?

A Yes, sir.

Q Now, turn to page 3 of your report. I take it you have taken the per capita consumption for domestic and commercial classifications in Calgary as 77 Mcf. per annum?

A That is correct, yes, sir.

Q Now, on the basis that one customer is equal to four persons -- would you agree with me on that as a general standard?

A I have not related customers to population, I have just used the gross population.

Q Well, do you know anything at all about estimating gas markets? I mean, if you are going into a town to find out how many customers you have, how would you relate your customers to your gross population?

A I would not, sir. I would use the gross population.

Q Do you know anything about the experience that four persons equals one customer?

A I have seen it used as a rough estimate.

MR. C.E. SMITH: It was used here.

Q MR. McDONALD: Mr. Brownie has 45,000 into 173 and it works out roughly four persons to each customer?

A Yes.

Q Well, taking that then, you have four times 77. What would you come to there?

A 4 times 77 would be --

Q That is 308 Mcf.?

A Yes.

Q Which is considerably higher than Mr. Brownie's statement of the actual experience in 1949 of 214, is it not? That is domestic only, of course.

A Yes.

Q Now, you would add to that your commercial?

A Yes.

Q Your commercial is roughly one-half of your domestic, is it not, according to Mr. Brownie's figures?

A Yes, sir.

Q If you are looking at Exhibit 96, it is 95 as against 64?

A Yes.

Q So that on a rough comparison basis Mr. Brownie's figure would be roughly 310 Mcf. for the combined classifications?

A Yes, that would be right.

Q Now, you will note that he has used -- his actual for 1949 of 214 per customer, he has used his commercial actually in 1949 1,004. In his estimates for 1960 in both classifications he is slightly lower?

A Yes.

Q That is true. Now, as I take it from your evidence, you have increased your estimate by a slight amount, that is, from 77 Mcf. to 79?

A That is right.

Q And I just do not actually understand why you did it.

It was related to a population per 1,000?

A It was related to the fact that from an examination of the figures we did not think that they were at full concentration in the total area served by Canadian Western nor by Northwestern.

Q Now, can you name any place in this continent where there is a greater saturation of gas customers than in the Canadian Western area?

A Looking at the area itself we thought this, for instance, that you were going to get a larger number of -- the population will grow and that the gas requirements per unit of the population would also grow slightly because of differences in housing and also that there will be a few more tie-ins, a little additional growth of the order that we had in the last 10 years, so that just to be on the safe side we put it up 2. Maybe we should only go up 1. Maybe it should be the same but it is better to be a little over than a little under, so we are in this instance a little over.

Q Can you tell me anywhere where there is a greater saturation of gas customers than in the City of Calgary?

A Not that I know of.

Q It is about 96 to 97 per cent?

A That seems to be indicated.

Q You do not presume in 1960 you are going to have more than that, do you? Are we going to increase our saturation?

A No, I do not think that it will go up very much.

Q Are you going to increase it in Lethbridge?

A No, I would not think so.

H. Harries,
Cr. Ex. by Mr. McDonald.

Q Now, with regard to the use per capita, I would refer you again to Mr. Brownie in his evidence before the Natural Gas Utility Board on January 22nd, 1946. The exhibit is "Future Market as related to the gas rate, August 1945", which is Exhibit 137 in that Hearing. Now, the purpose of this exhibit, Mr. Harries, was to show that the per capita consumption of gas in Calgary was decreasing and there are a number of items raised. One was insulation of buildings. Now, have you given any consideration to that, that all new buildings will be insulated?

A Yes.

Q You have?

A Yes.

Q And is that reflected in a reduction per capita?

A Just a moment, sir, and I will find these.

MR. C.E. SMITH: The statement that, "all new buildings will be insulated," and the witness said "yes".

MR. McDONALD: Better make it the average.

MR. C.E. SMITH: I just wanted to be clear on the answers.

Q MR. McDONALD: You would take that into account? Did you take insulation into account?

A The basis upon which we arrived at these per capita figures was by looking at the per capita sales of both Canadian Western and Northwestern in the years 1936, 1941, 1946, 1947, 1948 and 1949, and their estimate for 1960. We found that the actual per capita sales have increased from 55.3 approximately in 1936 to 80.3 in 1949. From these figures there appears to be no decrease

in the per capita sales in that 14-year period.

Q Now, that is both commercial and industrial?

A That is commercial and industrial combined, yes, sir. There is no decrease and the fact that there may be more area per person to heat in the next 30 years would have a tendency to increase that per capita requirement. The fact you have better insulation and more efficient use of the gas would tend to decrease it. We allocated that requirement between the City of Calgary, the City of Lethbridge and the other parts of the system on the assumption that your 1951 or, pardon me, that your 1961 average would be 80 and that is the basis upon which the per capita figures were arrived at. I see no decrease in the per capita sales.

MR. C.E. SMITH: Somebody used the word "commercial and industrial". You mean, domestic and commercial? As a matter of record, that will come out where it was said.

MR. McDONALD: Yes, we are only discussing domestic.

Q THE CHAIRMAN: You did mention industrial, domestic and commercial, is that right?

A Yes.

Q MR. McDONALD: Does this figure you are giving me include the Northwestern Utilities?

A That is Canadian Western only.

Q Canadian Western only?

A Yes.

Q And what is the figure for Edmonton?

A Edmonton, the only figures we had were from 1940 to 1949. During that period the per capita sales increased from 35.3 approximately up to 78.2, .3 to be more correct, and that is shown as a very substantial increase.

Q That is because of the connection with the new loads?

A It is a combination of connection of new loads and connecting some of the isolated areas that did not have gas into them until you got new housing developments.

Q You think you have made allowance for everything that could be taken into account in your estimate?

A I believe that these estimates are liberal.

Q Now then, just turn to page 9 dealing with the same matter. The last paragraph you have,

> "The first of these groups comprises the Ordinary Industrial Requirements, which are those requirements directly linked with urban population growth. Such enterprises as restaurants, laundries and small food processors....."

and then you add, as I take it, 10 Mcf. per capita per year to the domestic and commercial which you have already taken into account?

A Yes, sir.

Q Is that right?

A That is right.

Q Now, are you quite correct in 10 Mcf. per capita per year? Are you going to add 20 next year and 30 in the next, is that what you mean?

A I do not quite understand you.

Q That is on page 11?

A Yes.

Q It is not cumulative per year?

A No.

Q All that increases as the population does?

A That is right.

Q Now then, would you just explain to me what commercial means? I thought that the definition you used under what you call the Ordinary Industrial Requirements is identical with what the Gas Company have always said the commercial classification was.

A Well, I discussed generally those definitions with one of the people in the Northwestern and he informed me that, for instance, a restaurant is included in an industrial category rather than a commercial. But what we attempted to do there was sub-divide all the gas company have listed in their various exhibits as industrial on the basis of those industrial requirements which increase with population and those which may be independent of it. So that we have what we have termed Ordinary Industrial, which increases with population, power generation requirements which to some extent are dependent on the population, and No. 3, your major industrial requirements which are largely independent of population growth, and upon analyzing the industrial requirements of Canadian Western and Northwestern, excluding the Nitrogen Plant and the Imperial Oil in the Canadian Western load, and excluding the refinery load in Edmonton, and the power plant load in Edmonton, we came to the conclusion that 10 Mcf. a year would be a reasonable figure to use in connection

with this category which we have described as Ordinary Industrial.

Q And it is not included in what we have discussed here for many years as commercial?

A No, it is not, sir.

Q Now then, I just wanted you to turn to Census Division 2, the statement on Census Division 2 at page 17 of your exhibit. You have Cardston UF. Now, you have 1951, .25, which is 250,000 Mcf. Now, is that not connected here? Is it connected this year?

A No.

Q And similarly for Magrath and Raymond, they are not connected as of this time?

A No, sir.

Q And have you included this total of 3.274 billion cubic feet in your total calculations?

A No. The 1951 requirement is based on the figure from the distribution of requirements immediately below that table and it excludes any of the communities designated with the LF or the UF character, and what we assume is that from 1951 on the load is increased by the addition of those communities so that by 1961 you have them all hooked up, so that Cardston is not included in 1951 total, but in 1961 it would be included in Canadian Western's load.

Q And you have used a straight line presentation between the two across as between the two dates?

A That is correct, yes.

Q That refers to all of the Census Divisions, does it not?

A That is correct. The 1951 figure is the one found in the small table described as "Distribution of Requirements, MMMcf.", and it is a total of those communities which are designated with the UP or LP.

Q Now, as I take it, in your major industrial you have made the several assumptions as to large users?

A That is correct.

Q And you have not attempted to designate those to different types of industry?

A No, sir.

Q I notice that you use the word on page 14, "Branches of Mining". I was wondering what you have in mind there. Was it coal mining?

A No, I do not think that that would be particularly stimulated by natural gas. What I was thinking of there was probably development in the Northwest Territories which may be reflected in increased activity in Alberta rather than actual increase in activity in Alberta.

Q And generally on this subject, what would you think of this proposal mentioned by others, the development of petroleum industry will follow further discoveries of oil and gas, and that any large increase in the petroleum industry would be taken care of by other gas requirements, will be taken care of by discoveries which will in fact bring the industry in?

A I think that is something that you definitely have to contemplate. That is, a petroleum industry grows itself as the gas industry grows, it generates an industrialization of this nature, that is, the two things do not

grow independently at all.

Q You reference to forestry is mainly the reference to pulp mills?

A Pulp mills, and there may be increased use of some poplar, an essential for plywood.

Q Now, with regard to freight rates, the only thought I wanted to leave with you on that was this, that there have been increases in the rates. This levelling of the rate is not going to result in any saving to the people here except competitively?

A Well, there is every likelihood that it will result in an absolute saving and it will result in an appreciable relative saving.

Q Now, turning to rural electrification, on page 9 you refer to 2500 Kw. hours?

A Yes, sir.

Q Did I understand you to say that this is a large amount of electricity for a farm to use?

A It is almost double the present annual use on Alberta farms.

Q Have you any reason to anticipate that the present farmers are not making use of electricity when they have it? Why should you double it and then use it over all these years?

A Well, there has been a steady increase in the use, in the per farm use of electricity across Canada stimulated by better incomes and more intensive farming and so on, and I wanted to make the requirements ample in this case, and we took 25 as being a top figure, and there is little

doubt an average of 25 would not be reached until some time in the future, but in order to be perfectly sure that there was enough gas being left we maximized the annual requirements.

Q Now, also read your next paragraph to indicate that the 30 cubic feet of natural gas per kw. rather is also a high estimate.

A Yes. We felt that and we used 30 instead of 25 or 20 because we wanted to make sure there was an adequate amount of gas allocated in this brief to that use.

Q Now, would you tell me this, as I understand your presentation, that you look for this gas that is going to be available to farms, for farming electricity, to be local supplies rather than pipeline supplies or transported in any real distance?

A I would think it would be primarily local supply, yes.

Q So that one or two well fields which have a reasonably good supply of gas could be used for this purpose?

A Oh, yes.

Q And to that extent you say that they should be considered in the reserve picture of the Province?

A Oh, yes, definitely for this use.

Q I am thinking of, say, fields of say a billion cubic feet that could supply a small community for 20 or 30 years.

A Yes, I think the requirements for rural electrification and also what we have called the urban requirements may in many instances be served from fields which you would in the ordinary course of events call uneconomic, that

is, under a million type of thing.

Q MR. C.E. SMITH: Can you illustrate that by map geography or to some such thing, some 1 or 2-well fields we have discussed that might be used in the way you are talking about? I do not want to interrupt.

Q MR. McDONALD: A good illustration is Bassano where you have a very, very small field to start with and serves its population for many years and then one single well was discovered very close to it and that was carried on. Would that be what you had in mind?

A Yes, Northland Utilities are now using gas from Athabasca, I believe, in a gas diesel engine to generate electricity and that provides their source of power. What we had in mind was something where your transportation costs are already at a minimum, where you have the gas right in the centre of the area where the electricity is demanded so that there is a minimum of cost in exploiting it, and that must presume, I believe, that the field has a very limited use outside of some particular process such as we have suggested.

(Go to page 897)

Q MR. McDONALD: Well, Mr.Harries,....

MR. PORTER: Vauxhall, I think, is something useful. That is an area where they are contemplating an extension of irrigation. Are you familiar with that?

MR. C. E. SMITH: That is getting closer. There may be farms there if they get irrigation.

Q MR. McDONALD: Another illustration would be Tilley in that immediate area?

A Yes.

Q I take it you agree with me, Mr. Harries, that these small fields, one and two-well fields, are still of vital importance to the economy of the Province?

A I think they could be made very, very useful in a scheme such as this.

Q Now, first dealing with this matter of generating power in the larger sections?

A Yes, sir.

Q I take it you have Calgary and Edmonton, the electrical power generation, and that is on page 13.....

THE CHAIRMAN: Mr. McDonald, I think we might adjourn now.

MR. McDONALD: Yes, sir.

(Hearing resumed after short adjournment).

Q MR. McDONALD: Mr. Harries, dealing with the point we were discussing at adjournment, if account were taken of the requirements of the Province, the total requirements of the Province could be met in the use of these small fields for rural electrification purposes?

A That is correct, sir.

Q And then would you agree that the same fields or gas equivalent to that should be taken into the total gas reserve statement of the Province?

A Yes. There are some fields, for instance, Midland, in Census Division 11, which may be the type of source that you could use for the rural electrification scheme. And then there is Spedden in Census Division 13. Those may be examples of the types of fields you could use in connection with rural electrification, and if you were adding those requirements in, I presume it would also be realistic to add them into the reserve figure.

Q Yes. Now, dealing then, Mr. Harries, with your statement as to the generation of electrical power for major installations, I take it from you that your figures reflect the use of natural gas for the generation of the electrical demands of the Province during the next 30 years?

A That is correct, sir.

Q You state that no hydro power will be generated outside of the Bow River area?

A That is right, that is my assumption.

Q Am I right in thinking that the Bow River area is almost completely used up as far as installations are concerned, or do you know?

A I understand that it is practically.

Q But you would not care to say?

A I would not care to go on record definitely, no.

Q Well, it is certainly a large installation?

A Yes.

Q Now, then . . .

A Incidentally, we made that assumption on the basis of a

statement by Mr. Russell, I believe, it is, of the Alberta Power Commission.

Q In the same statement did not Mr.Russell state that the total hydro-electric potential of the Province is some 1635 thousand horsepower?

A That sounds like a reasonable figure.

Q So that over the next 30 years there is a good chance that somebody will go looking for some of that hydro-electric horsepower?

A It is available and they may go looking for it.

Q It is available and they may go looking for it?

A Yes.

MR. C. E. SMITH: Where are they going to look for it?

MR. McDONALD: That is a large question.

MR. STEER: It is not a secret, is it?

MR. McDONALD: No, and I am not going to give evidence.

MR. C. E. SMITH: I thought you could suggest.

Q MR. McDONALD: There are sources on the Athabasca River and on the North Saskatchewan River, do you know that, Mr.Harries?

A I know that the 1945 reconnaisance survey by the Power Commission of the Alberta Government has located certain potential spots on both those rivers. I remember seeing a reference to a map which they drew up in which, I imagine, there would be five or six different sites that they know of as potential sites.

Q And those are relatively close to the populated parts of the Province?

A I would not want to rely on my memory to answer that.

Q Now, we have another source of power, and that is coal?

A Yes, sir.

Q Now, could you tell me whether these figures are about right; My information is that in 1948 there were 297,308 tons of coal used for power generation?

A I have not got those figures with me, sir. I know that the amount of coal used for power generation is contained in the statistics issued by the Department of Mines.

Q Yes?

A And also by the - it can be calculated from figures issued by the Alberta Power Commission.

Q Well, the figure I quoted was from Alberta Facts and Figures for 1950. Is that an official publication?

A I think in some circumstances it may be an acceptable source, yes, sir.

Q And you do not know about the circumstances?

MR. C. E. SMITH: What is the good of asking an expert if it is an official publication?

MR.PORTER: That would not be related to elections.

Q MR. McDONALD: The tonnage I had was 297,308 tons, would that be about right?

A I think so.

Q Yes. But I take it from your proposal here that it is proposed to, or by your proposal you intend to replace all of that coal by gas?

A We assume there will be conversion to gas, yes, and those figures that we have arrived at would pretty well assume that to be the total gas.

Q With regard to the Northwestern Utilities Limited, you have taken into account the use of all the boilers in the Edmonton plant being converted to gas?

A Yes.

Q Now, so that leaves the Bow River as the hydroelectric source, and natural gas as the other source of energy, for the next 30 years?

A That is substantially correct, sir.

Q Now, what can you tell me about the economics of the use of coal and gas for power purposes, at what price does coal and gas become competitive?

A I have not those figures here, sir. I would rely upon the figures given by the Dinning Commission which were calculated by, I think, - it was not Clark, but there are some figures in the Dinning Commission Report which indicates the competitive position of coal and natural gas on a BTU and an efficiency premise.

Q Yes?

A And those, I think, would be the correct ones to use.

Q Well, you have not had a look at the experience record of the Edmonton Power Company?

A I have looked at it, sir, through some information that the Alberta Research Council has on file, yes.

Q And do you think if there was an increase, or can you help me at all, or can you tell me whether $2.00 coal would be equivalent to the present price of gas? Can you tell me anything about that, or do you know?

A I do not remember the figures. It seemed to me there was something in the nature of $2.15 coal laid down at the plant as being about equivalent.

Q To the present. . .

A To the present cost of gas for the plant.

Q Yes?

A And as I remember it, there was a problem of the different prices from different means to supply the Edmonton plant, and the $2.15 was about the lowest that they could get the coal, and that was probably at the competitive margin between gas and coal.

Q So that if there is a substantial increase in the price of gas, the picture could change and there could be conversion back to coal?

A Yes, and it depends where your power plant is relative to coal and gas supplies. If you put a power plant right at the source of the coal - for instance, the Edson plant that is going in, the pulp plant that is going in, has very cheap, I believe, coal, and it does not appear to me that gas would be competitive in that situation.

Q Yes?

A If you get some place where you have to haul the coal 100 miles and the gas is right at the plant, your competitive situation is different.

Q If you put your generating plant at, for instance, Wabamun, is there a deposit of coal there, do you know?

A Wabamun?

Q Yes?

A Yes, that is a coal area.

Q It could very well arise that it would be cheaper to develop electricity from coal in that particular spot than it would be right in the City of Edmonton?

A Oh, yes.

Q So that in making your submission here to the Board you are taking it that there are lots of ways in which coal could be utilized instead of gas, and there still would be not much of an economic difference to the consumer?

A Oh, yes, definitely.

Q Now, having regard to this future demand and the increase in the demand for gas, would you agree with me that the demand for gas in Calgary was built up during an era of very cheap gas?

A Relatively cheap, yes.

Q And the same thing applies to Edmonton?

A Yes, the Edmonton demand in the last 10 years has gone up, and I presume that that is going to appear relatively cheap after 20 years from now.

Q Now, if the price of gas should go up due to the fact that these cheap sources of supply are nearly running out, for instance, Viking-Kinsella is going to be less and less a source for Edmonton, and it is a very cheap source of gas,and, similarly, Turner Valley has been a cheap source of gas for Calgary, and when more expensive sources of gas come in, and the price of gas goes up, what would you say then if the rate of progressive increase in the use of gas is going to continue?

A If conceivably the price goes up enough, you could almost cease your extensions to the existing systems and appreciably cut down the gas requirements in the areas already served. It is difficult to say just what the demand curve for gas is in the particular circumstances. It appears, however, that once you have got it in for domestic use, it is fairly inelastic, and in industrial use, on the

other hand, it is quite elastic, and power plant use is probably the most elastic of all.

Q If the price goes up, the tendency to use gas even in installations that are now in use, would decrease, would it not?

A In industrial and commercial installations, yes. In domestic I would say not to the same extent at all.

Q But there would be some?

A Yes.

Q And as has been suggested in evidence with regard to the question before, the average individual will use his house, or will have his temperature lower in the house, and instead of it being 75° he will turn it down to 70, and there are a lot of small economies of the same nature that could be made?

A Yes. Probably in domestic use it is related more to the income status of the consumer as that is related to the price of the gas, than simply a function of the price of gas.

Q So that to sum-up what your statement is, with very favourable factors, or with every favourable factor operating for natural gas, you feel there is a maximum and that is a very generous allowance for the Province of Alberta?

A I think the basic view is optimistic, and that the gas requirements, assuming that optimism, are ample,yes.

Q And if circumstances should favour the use of coal, or go against the use of gas in the matter of price, then there would be less demand for gas than you have set out?

A Oh, most certainly.

Q Thank you.

.....

CROSS-EXAMINATION BY MR. BREDIN:

Q Mr. Harries, on page 39 of the Interim Report, Mr. Russell states that "The gas required by 1960 for the generation of electric power could be estimated at 20 billion cubic feet.", and I notice in your Table 5 that you have placed that figure at 8.740 billion feet. Have you any reason for making an estimate so substantially different from Mr. Russell's?

A I think Mr. Russell was very optimistic in his extrapolation of the gross curve of electrical consumption.

Q I wonder if you have taken into consideration the fact that Calgary Power, for example, has now reached a state where, as Mr. McDonald has pointed out, where it is becoming increasingly difficult to provide hydroelectric development so that the result may be, as the cities particularly grow, that it may be necessary to resort to a much higher cost with regard to hydro power development, throwing your graph or curves considerably out? That is, the demand for gas may increase as a factor for hydroelectric use due to the higher cost of hydroelectric development, is that not feasible?

A It is feasible, but you have got such a spread now between the two costs that as long as your transmission is not too great, you can still put some pretty expensive hydro development in, and still have it competitive for natural gas use for electrical generation.

Q And you think that, having regard to that, you think Mr.

Russell is undoubtedly optimistic in his 20 billion estimate for that requirement?

A Yes, I would consider that a very optimistic estimate.

Q Mr. Brownie, when he was here the first day, stated that he was forced, as the result of the large development of industry, particularly in the areas surrounding Edmonton, to revise his estimates upward. Have you taken into consideration the factors which caused him to revise his estimates upwards?

A You are referring to his statement the first day of the present sittings?

Q Yes, I am?

A I read that, and he indicated, I believe, that the industrial requirements in the Edmonton area had grown in comparison with what he had anticipated, but our figure in 1961 of 25 billion feet of gas available for strictly heavy industry, is far in excess of what the gas industry had ever anticipated in their estimate and, consequently, I think that our figures give ample, have ample regard for any increase that Mr. Brownie had anticipated.

Q You are satisfied that you have taken care of any contingency of that nature?

A Oh, yes, sir, of the type that he has anticipated, certainly.

Q That is all I have.

THE CHAIRMAN: Mr.Smith?

MR.C. E. SMITH: Just one or two questions. As usual, most of the things I was going to ask have been dealt with.

.....

CROSS-EXAMINATION BY MR.C. E. SMITH:

Q However, as I understand it, Mr. Harries, you, with the exception of Medicine Hat possibly, reach your saturation point in 1961, is that correct?

A That is correct.

Q Because I think you discussed with Mr. McDonald, for instance, in Calgary, and I am talking about only the domestic and commercial now, of course?

A Yes, sir.

Q Your 77 Mcf per capita consumption increases to 79 in 1961, and then it levels straight off through 1981, and even your 2 increase was a matter of being safe, or conservative, or whatever language you want to use, is that correct?

A That is correct, sir.

Q I wonder if you would just deal with Medicine Hat briefly, if you can, because in that case there is really a drop, isn't there?

A Yes, sir.

Q And I was not sure that I understood your explanation as to why?

A Well, the figures that were used for Medicine Hat, they are found in the Dinning Commission transcript, and related the figures given for domestic and commercial sales for 1937, 1941 and 1946. Incidentally, those were given in the testimony of Mr. H. O. Davis, in Volume 1, page 61, of the Dinning Commission. The relationship between population and sales was of the order of 78 Mcf in 1937, dropping to 77 Mcf in '41, and increasing to 85 in 1946, which was the last year for which we had statistics. Now,

he said in testimony that he thought there might be an error of 17% in the sale figures for the domestic and commercial requirements, so that that would put us very close to 100. We used that figure then in 1951, but we felt that by 1961, because that was so out of line with the requirements of a place like Lethbridge where the temperature was almost the same that that could be reduced to 95 and still probably over-estimate the requirements, because if the 1951 requirements are correct, which, on the basis of comparison, one might suggest that they were not, the 1961 put at 95 would reflect decreases due to (1) more efficient use of the gas, and (2) a higher cost of gas, which we would anticipate over the next 10 years, so that if, in fact, they are using 100 today, 95 would be realistic if the price went up a little, and that would tend to take it off.

Q Well, in brief, Mr. Harries, I take it that you are assuming that somebody else's assumption about this error is correct, is that right?

A That is right.

Q Is that the idea?

A Yes.

Q It is a little difficult to understand that situation unless we do here some explanation like that?

A Yes.

Q Now, with regard to your levelling off in 1961, that is the point of saturation, have you any places where you have had experience that will illustrate that your figures in your assumptions here are a good estimate? Do you follow me? By way of experience in the States or any place else?

A No, we have based these purely on figures which were available to us in Alberta, but as far as the concentration goes, it appears from past performance that we are very close to saturation now. For instance, in the Edmonton system, the Northwestern estimates originally anticipated quite a substantial increase between 1949 and 1960, but I know that in the testimony of Mr. Brownie, in the first day of the present Hearing, that he expressed the opinion then that there was a saturation, that they were approaching the saturation point in Edmonton, so that it is on the basis of the Calgary performance, and of the suggested performance in Edmonton by Mr. Brownie, that we hold the per capita consumption from 1961 on at the same figure.

Q All I mean is, that there is no other locality any place that could help you to illustrate your point?

A No, sir, not that I know of.

Q Nothing that you know of that you can compare it to?

A No, sir.

Q All right. Now, I understand that in Census Division 6, and you will probably remember this well enough, the gas per capita consumption for the City of Calgary, you have as 79, whereas the other urban centres, if I may call them that, that is at 104 Mcf per capita. Will you explain the difference, Mr. Harries?

A Well, we looked at the housing census of 1941, which is the last, and which is the latest data that we have available on housing, and we found that in the. . .

Q What is the official record, Mr. Harries, can you tell me?

A The housing census of 1941.

Q Where is that found?

A It is published - that is the title of it,"Housing Census - 1941", published by the Dominion Bureau of Statistics.

Q Dominion Bureau of Statistics?

A Yes.

Q Yes?

A Here, for instance, they compare the single houses as a percentage of the total dwellings, and that is on page 4 of the Report for Alberta. We find that over all Alberta we have 90.7% of the total dwelling houses that are single-housing units. Now, that is broken down by farm, by urban centres under 1000, urban centres 1000 to 5000, urban centres 5000 to 15,000, and urban centres 30,000 and over.

A We found that there are 90.7 per cent of the total dwellings in Alberta are single houses, and 98.2 per cent of the farm dwellings are single houses. When you have an urban community with a population under 1,000 we have 91.6 of the total dwellings are single houses. As you move up to an urban centre greater than 30,000 you find only 75.9 per cent of the dwellings are single houses.

Q What is the date of that thing, again?

A 1941.

Q Probably even goes much more presently, wouldn't it? I mean, take apartment blocks and dwellings and so on.

A Yes. We looked at the comparison between Calgary and Edmonton and Winnipeg, Hamilton, Toronto, Montreal and Ottawa, and we found a percentage of single houses related to the total dwellings as much less than it is in Calgary and Edmonton and with the development of apartment projects in Calgary and Edmonton you would expect it to come down.

Q By the way, before you continue, will you explain your expression "single houses"?

A Those are houses --

Q Has it any relationship to Mr. McDonald's 4?

A I think it would have. The dwellings are all separate -- what is the word, anyway? A dwelling is not a place where one family lives but a single house is a house which provides accommodation for one family. An apartment block is considered a dwelling. A duplex is considered a dwelling, but a single house is accommodation for only one family.

Q But it has no relation to the number of people in it?

A No. They also give figures of single units as percentage to the total units, the number of rooms per dwelling, the number of persons per dwelling, and they also give information on the heating systems. So that we find that the number of rooms per dwelling was significant, there was a significant difference between the number of rooms per dwelling in those places under 1,000 and those over 30,000. There was a 6.5 per cent increase in the rooms per dwelling as you moved from under 1,000 to over 30,000; 18.1 increase in the persons per dwelling between those two, so that the effect is you have more persons per dwelling in the larger communities, which would indicate that there are more persons per square foot. And then looking at the heating system, we find there is a significant difference between under 1,000 and over 30,000. So on the basis of these figures we concluded that it would be realistic to put a higher gas requirement per capita into the urban areas outside of the cities than you had in your cities because there are less apartments and your efficiency of use would be less.

Q In other words, there would be more single units outside of Calgary than there is at Okotoks or Millarville or some place like that?

A That is correct.

Q Well, tell me, will there be any other statistical data report such as you have mentioned as of 1951?

A The 1941 was the first one they ever put out and they did not do it for the 1946 census, but I understand they

are going to have one for the 1951 census.

Q Tell me, have you had any opportunity of examining any figures with regard to population or anything else so far as your work is concerned with regard to any 1951 Dominion statistics?

A No. Unfortunately, no, sir.

Q You have not had anything of that nature available?

A No, sir.

Q I take it you have had available to you city census and things of that nature, and utilities and so on?

A That is correct, sir.

Q And you have carefully considered those in the preparation of this report in addition to your own judgment?

A Yes, sir.

Q But there is nothing Dominionally, so to speak, that you have had an opportunity of having a peek at?

A No, sir.

Q Now, with regard to the difference, I think you drew the line between census, between 1 and 6 and 7 to 16, and I speak of the Delhi method of census, that is correct, isn't it?

A Yes, sir.

Q I wonder if you would elaborate a little further on the difference you had between those categories. I will call it north and south Alberta. Is it just climate?

A Yes, primarily. The differences between the Calgary and Edmonton systems reflect to some extent the difference in the heat requirements brought about by climatic conditions.

Q Is it colder up in Edmonton than Calgary, is that what you are saying? Dr. Govier shakes his head.

A On particular days it does not seem so, but on the average, taken from the Canada Year Book for 1948-49, at page 62, it would indicate that the annual day degrees, that is the term, annual day degrees, in Medicine Hat are 8,495, an increase for Calgary to 9,111; to Edmonton to 9,826, and Beaver Lodge 10,950, so that there is a significant difference as you go north.

Q There is really something in latitude even between here and Edmonton, is that what you mean, Mr. Harries?

A Yes, sir.

Q Is there any other reason for the difference besides climate or temperature?

A No, it is climatic factors we take into consideration.

Q Nothing by the way of the north being slightly newer, newer houses, different methods of construction, nothing of that?

A No, sir.

Q With regard to your degree days, where did you get your information with respect to that?

A From the Canada Year Book 1948-49 edition at page 62.

Q And you adopted that. You did not do any mathematical calculations yourself with regard to the information you could get locally?

A No, sir, I did not.

Q Now, I wonder, would you draw your mind to Wainwright. I think that is in census division 7.

A Yes, sir.

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Exam. by Mr. C.E. Smith.

Q And I think you show Wainwright as 111 Mcf. per capita, is that correct?

A Yes, sir.

Q And what I suggest is this for your consideration, they have had gas there for a long time?

A Yes.

Q Since about 1930 or maybe a little earlier?

A Yes.

Q And what I have in mind is this, it has been suggested to me that the per capita consumption in Wainwright for the past 5 years has been between 70 and 80 Mcf. Does that agree with any information you have got?

A We do not have the figures for the Wainwright system, sir.

Q Well, have you anything you can use to consider it now? If I assumed, as so many people have done, that that be correct for the past 5 years, it has been 70 to 80 -

A Yes.

Q - I want you to relate that to your 111 that you arrived at, or can you relate it in any way?

A No, sir, we can not relate it. What we did was take what we thought was a maximum use and applied it to the population.

Q What I have in mind is this, Mr. Harries, if Wainwright has been supplied with gas over, say, somewhere in 1930, maybe a little earlier, and if 70 to 80 during the past 5 years be correct, it would make me think that Wainwright has reached its saturation point now and that should be more near to the figure we should consider than your 111.

A I think that that is correct.

Q This does not hurt the person who called you, of course, but I want to get it.

A Yes, that is correct. I think that probably all the figures which can be compared with actual experience could be readjusted on the basis of experience that would make this estimate more accurate.

Q And if that be so, I suppose the other urban centers in that same census might be compared to Wainwright with regard to 70 and 80 and again be compared to 111?

A Yes, sir.

Q What about Lloydminster and the same idea? Have you had any opportunity of studying it in particular?

A No, sir. The only figures we checked were the 1950 distribution on Northwestern lines and that seemed to be certainly higher than 70.

Q There is no good me bothering you with figures. It is somewhat similar to Wainwright in that it has had gas for some years?

A Yes.

Q And it has been suggested to me that during the past 5 years it ran 70 to 81 Mcf. per capita as compared with your 111 again at Lloydminster.

A Those figures are very interesting. As I say, these are estimates where the experiences available could be readjusted to conform with the experience in those.

Q I won't correct the figures, but I think you will find they are very close. I was wondering whether or not we could consider that the saturation point had been reached as of now, 81 say in both cases?

A Yes, I think that would be realistic.

Q There is no good of me dealing with Athabasca, I suppose. You are in the same position there?

A Yes, I have no figures on Athabasca.

Q And with regard to Edmonton, census division 11, you are considerably different in per capita consumption between Edmonton and other urban centers in that division?

A That is correct.

Q Is your explanation that you have given a moment ago with regard to Calgary, that applies in the same way?

A Yes, it would, if you compare Edmonton to Jasper Place, for instance, that indicates the type of difference you are up against.

Q And the same answer would apply to Edmonton as Calgary and other urban centers in Calgary, is that correct?

A Yes, sir.

Q I take it, and I think you mentioned a while ago, incidentally, while we were on urban, you had mentioned in your submission a trend, if that is the correct word?

A Yes.

Q A lot of people are coming into the cities nowadays, more so than usual?

A Yes.

Q Do you believe that is so?

A Yes, the figures indicate it.

Q And you have considered that in your figures that you have submitted here?

A Yes, taking the population in toto, I believe the figures for urban now are roughly 45 per cent of the total, the rural is 43.

Q Would you quote me at least what you refer to?

A The census figures for 1946, and rural non-farm is about 12. Now, when we calculated out the urban we did that quite independently of any total. We calculated out the rural independently and we got a distribution of 35 per cent farm in 1951, 16 or 17 rural non-farm, and what we have termed non-urban, and the balance urban, which put the urban up to 53 per cent. No, approximately 48 per cent urban.

Q And that is the way you figure as of 1961?

A As of 1961. Then for 1981 we assumed that the rural would hold at 35 per cent.

Q We do not want to lose all our farmers into the city, I hope, Mr. Harries.

A No, but that seemed to be reasonable in terms of the past development and that is allowing for increased numbers of farms at the same time, because your population is growing but percentagewise it is not growing as rapidly.

Q With regard to increased number of farms in your discussion with Mr. McDonald about the use of gas for electrification purposes, I think 1 or 2-well fields were mentioned?

A Yes.

Q You would have to have an awfully good concentration of rich farmers before anything like that would be done, wouldn't you?

A I do not think so, sir. I think that you can use gas to generate electricity for rural distribution because of the location. You can locate your plant in the

center of the demand and the differences in your generation costs between the cost of distributing electricity generated some distance away, those transmission costs would be made up by your cheaper generation cost and so the margin that you have available between your transmission cost and your generation cost would go towards distribution costs from the plant located on top of the gas, as it were, so that you do not need a very wealthy community or a higher concentrated farm population.

Q You certainly need a lot of people to pay for this, or a few people to pay a lot for it. Can you give an illustration where that can be done? Take a look at the map or any place else.

A It is being done out of Athabasca now.

Q That is serving Athabasca town?

A No, Northland Utilities run a country line out of there, I understand.

Q Is that all they do?

A No, they serve the town also.

Q I thought you suggested that some farming community could operate, as was suggested to you, by a 1-well field?

A That is correct. I do suggest that.

Q Could you give us an illustration in that way, that is what I had in mind.

A I have a map which I am sorry I have not got available at the moment on which I have detailed the concentration by census subdivisions of these farm areas and there are areas where you have got sufficient concentration within a 20-mile radius and where there is no possibility of

rural electrification service, according to the present plan.

Q That will be interesting to me in any event, Mr. Harries.

A I would be very glad to provide a copy.

Q It would be by way of illustration of what we are discussing, is that right?

A Yes. It really just involves mapping our potential power user figures that we have in the tables dealing with rural electrification natural gas requirements.

Q Well, it goes a little further than that, doesn't it? It goes to the extent of showing an area where there are actual farms or farmers who might be able to organize this into such a scheme as suggested, is that right?

A I would suggest, sir, that if we plotted the potential power user figure that we have derived, that is, your demand, on a map then you can see the concentration from that plot.

Q I can not quite follow that, but if you get the map somebody else may, Mr. Harries.

A All right, sir, I would be glad to provide it.

Q Athabasca, Edmonton -- oh, by the way, in consideration with regard to population increases or anything like that, did you take any comparisons with places like the Board did, for instance, in their report, Texas, Oklahoma, anything like that?

A No, sir. The basis upon which this was done was that you related population growth to the particular community with which you are dealing, and while figures of that nature may be useful as a sort of check, we did not make

any such check because we felt that this procedure stood on its own feet.

Q I am not suggesting anything right or wrong about it. A lot of the other people in front of this Board did, and the Board in their report considered that.

A That is why we did not, sir.

Q And if I understood you a moment ago, your estimation of your population increases start, or are based on the 1946 census figures, is that correct?

A That is correct, sir.

Q And there is nothing we need add to that except what you have done?

A No, that is correct.

Q By the way, with respect to your -- I do not know whether to call it category or division or subdivision -- and what you call commercial and ordinary industrial requirements, can you expand a little bit on that? Deal with divisions altogether, will you, Mr. Harries?

A Well, the ordinary --

Q First, may I ask you this, do you make the same divisions that Mr. Steer's clients do?

A That is correct.

Q And you have some things in the same category?

A Yes, sir.

Q For instance, restaurants and industrial?

A Yes.

Q That seems awfully strange to me but that is so, is it?

A I understand that is correct.

Q And we can take it, then, that your divisions really are

the same as the Calgary and Edmonton Gas Companies, to use a short name, is that right?

A Yes, sir. Maybe by explaining the difference between our divisions and theirs would make it quite clear. Our domestic and their domestic is the same. Our commercial and their commercial is the same. What they term industrial includes requirements for restaurants and that sort of thing, the requirements for power generation and the requirements for refinery and Alberta Nitrogen and so on. We have taken their industrial and broken it down into three categories. We have taken the restaurant and so on requirement and called that ordinary industrial.

Q Where do you put breweries, is that ordinary? They come along whether there is a lot of growth or not. It seems industrial, and very important too.

A That is ordinary. It grows with population. The significant thing about the ordinary industrial requirement is that it is directly related to the population growth.

Q You refer to that in your submission?

A Yes. Then the second, the power generation, is aside from population growth and it is related simply to the amount of electricity that you are generating. The third, which we have termed major industrial requirements, are the requirements of the refinery and the Nitrogen Plant and any new petro-chemical industry, cement plant, pulp and paper plant and that type of thing.

Q Tell me this, Mr. Harries, as I remember and what I could understand of your submission, and that is my fault, not

yours, it seems to me that with regard to industrial you had an awful amount to put under what you call LF. Would you expand a little bit on that? What I have in mind is this, for instance, what we call the nitro-plant, the power plant in Edmonton and so on, are presently attached to Mr. Steer, yet in your submission you are going to attach an awful lot of future industrial to your LF. Would you expand a bit on that?

A Yes. We are attaching the major industrial gas users to the LF on the assumption that the very large consumers of gas will not be purchasing their gas from the Utility Companies, and we did that because we believe that competitively the major utilities are not in a position to get that market. That is, if a very large industrial user comes in here, and we have the example of the Celanese --

Q Take the petro-chemical industry?

A As illustrated by the Canadian Celanese plant in Edmonton, they are going to go out and get their gas independent of the Utility because they can get it cheaper.

MR. STEER: Perhaps.

A As I say, as indicated by the experience with Canadian Celanese, and for that reason we did not think it was realistic to put the load of the Utility line -- and there will be instances, I would presume, in which the location of the plants will be dictated by the supply of natural gas.

Q Are you pointing at Mr. Steer or at the petro-chemical

industry?

A Pointing at the wall.

Q I will be through in a minute.

A These plants, it would appear, go to the source of the gas if the other factors such as water supply and transportation are favourable so that they will be intimately connected with their major requirement, which will be natural gas, rather than locating, say, in the city where it would be more likely to get the gas from the Utility, so that with those things in mind we considered it unrealistic to put the major industrial requirement load under the future Utility load.

Q Well, I assumed that, but I wanted to make certain that was the reason, Mr. Harries. I do not think I have anything more I want to bother you with because there is something else coming along. Oh, yes, along this same line of questioning, can you help us a little bit for a few minutes about how you arrive at your estimate for future local use with regard to industrial?

A Only on the basis, sir, that it appears likely that there will be some relatively small plants come in using the order of 1 million, of a billion cubic feet a year.

Q For example?

A Cement or pulp or processing plants, for mining, such as this Lynn Lake project that may come in here. There is some cement. It seems definite that over the next 10 years we are going to get an expansion in that regard.

Q I notice your expansion runs from 2.5 to 39.7 over the

course of 1951 to 1980?

A That is right.

Q Is there anything significant, have you anything in mind by saying this or that will come, that will stay away? Help us in that way.

A Only with population growth and increased activity that we have had in Alberta, some of the things that have been talked about for years are undoubtedly going to come in. We can not say when they will come or where they will go but we feel quite certain that they will come and we have taken a very, very optimistic view of the industrial possibilities and allowed what seems to be ample gas for them.

Q I am not being critical of it.

A I understand, sir. I do not think you can relate industrial requirements to population growth or anything else. It has to be a reasonable and probably the best informed guess that you can make because so far there has never been any method by which the activities of the businessman's mind can be investigated. I mean, whenever you start --

Q You do not put them in the category of experts, do you?

A They certainly are experts when it comes to a matter of an industrial location. There just is not anywhere that I know of that you can take some growth curve and extrapolate it and say, "This is the kind of industrialization we are going to have."

Q Having regard to your table 6, major industrial, there is no other idea of so much percentage increase per year

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or anything of that nature?

A No, sir. That arises, sir, because we increased 2.5 to 4.32 by relating it, keeping that growth substantially the same as the percentage growth in Northwestern and Canadian Utilities, and then we added 25 billion in 1961 to get a 29.320 figure, and then between 1951 and 1961 we just read off the curve, and between 1961 and 1981 we read off the curve, so that your 1980 figure has got three decimals which are not significant. It could have been all rounded off and it probably would have been just as accurate and a little tidier.

(Go to page 927)

Q MR. C. E. SMITH: Somebody here by me understood that whether I did or not. I think I am through with Mr. Harries. If nobody else wants to examine him, sir,...

MR. STEER: I would like to ask a question or two.

MR.C. E. SMITH: I was going to say that somebody wants to intervene if there was no further examination.

.....

CROSS-EXAMINATION BY MR. STEER:

Q Mr. Harries, what investigation did you make as to whether it would be cheaper for industry to develop its own gas and carry it to the source where the industry was being carried on, as compared with the purchase of that gas from the established utilities?

A There are two things that we considered there, sir. First of all, the fact that industry could locate so that it would not have to have the gas carried to it, or they could locate very near the source of the gas.

Q Yes, I understand that?

A And the second thing was, sir, that where you have a relatively low load factor, such as you have on the utility lines now, it seemed to us that in actually carrying the gas with a very high load factor, which did not s eem, I am sorry, which it seemed reasonable to have in connection with a major industry, major industrial use, that you could cut your transportation costs.

Q Was that the extent of your investigation?

A Those are the two major factors that enter into it.

Q And did you study the rate schedules of the utilities in

the Province?

A- We have looked at them, yes.

Q And did you realize that those rate schedules are adjusted for growth factors?

A Yes, sir. I have read the judgment of the Board of Public Utility Commissioners in connection with that.

Q But you would not get that from the Board's judgment, you would have to go to the rate schedules themselves. Did you study those rate schedules?

A I thought, sir, that that was mentioned un the judgment of the Board, the relationship between the industrial and the domestic and commercial, and the various schedules.

Q Which judgment are you referring to?

A The rate schedules that they discussed in the judgment.

Q Which one are you speaking of?

A I am talking about the Calgary Hearing in 1948 or '49.

Q Now, you mentioned Celanese?

A Yes, sir.

Q Are you prepared to say that Celanese can purchase its gas from the sources from which it proposes to get it at a price cheaper than which can be supplied by the utility?

A I am only judging from what has actually happened there, sir, that they appear to think they can, and I am quite willing to accept their opinion.

Q Oh, yes, I have no doubt that they think they can, but you do not know whether they can or not?

A Oh, no, I am just going on their judgment.

Q In fact, you have not made any estimate as to the facilities that are required to take gas from the source from

which Celanese proposes to take it to their plant?

A Oh, no.

Q And that is a long distance?

A Yes.

Q Have you any idea how far it is?

A Oh, no, but I know, sir, that to do something like that would be a long study.

Q Yes. And have you any idea of what the size of pipe-line is going to be?

A No, sir, I did not inquire into that.

Q I see.

.....

EXAMINATION BY MR.PORTER:

Q Mr. Harries, there is just one question I would like to ask. At some time in my discussions with you, you had some figures relating to the cost of generating power, relating the cost of generating power to the cost of transmitting it, and it revolved around a distance of 200 miles? Do you remember those figures? That is, the relationship between generation costs and transmission costs, not distribution costs?

A I believe, sir, that if we had a generation cost of 2.6 mills per kilowatt-hour, and you transported that for a distance of 200 miles, your transmission cost would be something on the order of 4 mills.

Q Now, there has been a study of this made by the Power Commission, has there not?

A By the Alberta Research Council.

Q By the Alberta Research Council?

A Yes, sir.

H. Harries,
Dir.Ex. Mr. Porter.
Cr. Ex. by Mr. McDonald

Q To which the Board can have access?

A Yes. The study is not published yet, but it will be shortly available.

Q And is that a factor in your concept of local generation?

A Yes, sir. The study that the Research Council did influenced my thinking very greatly in connection with this rural electrification scheme.

.....

CROSS-EXAMINATION BY MR. McDONALD:

Q If I might ask the witness one question. I want to make sure if I understood him correctly. On page 1 of the Exhibit, the last paragraph, Mr. Harries, where you were dealing with this matter,

> "The most important category, in terms of volume, is the urban domestic and urban commercial segments which composes the non-industrial natural gas requirements of all the communities in Alberta with a 1946 population in excess of 300 persons."

Now, does that mean that in the subsequent schedules that you have included therein all of the communities which have 300 or more, and they have been allotted some standing in the requirements?

A That is right. The particular communities with which we have dealt are to be found on pages 16 to 31, and are given by census divisions.

Q Just one other question on that. This demand that you have set up here is on the basis of all of these communities in excess of 300 persons, and that all of these communities in

excess of 300 persons will have gas by 1960?

A By 1961, yes, sir.

Q Now, there are economic factors which may or may not affect that?

A Oh, certainly.

Q For instance, did you give consideration to this that a well was discovered, a gas supply was discovered in the Town of Hanna in January of 1927, 300 yards from the Town Hall, and there has been no system built into Hanna from that well?

A That is correct.

Q Yes. Now, there is another thought, too. You have referred to Cardston and Magrath, and if my recollection is right, the source of supply of gas to those communities was as much available in 1910 as it is today, and the gas has not been connected?

A I believe the Canadian Western did a study with regard to it, and they found that there was not a load big enough to justify putting a system in. That evidence is on record. But one of these days they are going to get gas, we presume.

.....

EXAMINATION BY DR. GOVIER:

Q Mr. Harries, in your opinion, should the Board revise upward the estimate it made of natural gas requirements as reflected by the Interim Report?

A My conclusion from this study, sir, is that the natural gas requirements, the total natural gas requirements, are somewhat higher than the Board estimated them. In

looking at it, or it has been suggested in cross-examination, the requirements have to be related to the supply in the sense that some of the places which we have suggested will receive natural gas, some of the natural gas requirements are going to be dependent upon small fields and, to some extent, fields that have not yet been discovered, and to that extent this estimate may be varied to bring it in line with the procedure used in calculating the reserves.

Q I have reference, Mr.Harries, to two comments you made during your examination. One was to the effect that you felt your figures were almost a maximum, and the other was to the effect that you felt there was a certain margin of error in your figures, and what I would like to know is, Do you think the Board should revise the figure it previously tabulated either upwards or downwards?

A No, I do not think it should be revised, because of the fact that I have got no reason to suppose that this total estimate is any better than the Board's estimate. I think they are substantially the same. I do not think there is that much difference between them that either one or the other could dictate a change.

THE CHAIRMAN: Thanks, Mr. Harries.

MR. C. E. SMITH: I wonder, sir, it has been mentioned to the Board and also to me, that it would be of some considerable convenience to somebody -if a submission by Britalta Petroleums Limited through Mr. Slipper, I think it is, could be given now. I think I have spoken to all counsel, and they did not seem to object, and Mr.Chambers is here with regard to it. If the Board

has no objection, and if it meets the Board's convenience, I think the rest are agreed.

MR.CHAMBERS: If the Board pleases, Mr. Slipper is here, and I have spoken to counsel, and they do not have any objection. I do not think I will be very long with Mr. Slipper, so that I would like to call Mr.Stanley E.Slipper now.

THE CHAIRMAN: All right, Mr.Chambers. The presentation by Mr. Slipper will be marked Exhibit 27.

GAS RESERVES OF THE MANY ISLAND LAKE FIELD SUBMITTED BY BRITALTA PETROLEUMS LIMITED MARKED EXHIBIT 27.

.....

STANLEY E. SLIPPER, having been first duly sworn, examined by Mr. Chambers, testified as follows:-

Q Mr.Slipper, will you be good enough to explain for the Board, or for the record, your connection with the Britalta Petroleums Limited? Are you an officer of that company, or in what capacity do you serve them?

A Yes, sir. I am the exploration manager for the Britalta Petroleums Limited.

MR.CHAMBERS: I understand, if it please the Board, that Mr.Slipper's qualifications and experience are already a matter of record, and I need not take up the time of the Board in having him give them?

THE CHAIRMAN: Yes, Mr. Chambers.

Q MR. CHAMBERS: Without more ado, Mr. Slipper, I would ask you to proceed with the reading of Exhibit 27 and to make any comments as you see fit as you go

along?

A This submission is entitled "Gas Reserves of the Many Island Lake Field", and it is submitted by Britalta Petroleums Limited.

The Many Island Lake Area lies northeastward of Medicine Hat, Alberta, and extends to the Saskatchewan boundary.

Q Mr. Slipper, may I interject there? Can you point it out on the map there?

A Yes, it extends from the Saskatchewan River here (indicating) over to the Saskatchewan boundary, in Townships 13, 14, 15, 16 and 17, Ranges 1 to 4, West of the 4th.

Q Yes?

A During the period 1921 to 1926, four wells were drilled for oil near Many Island Lake. While all of these wells reported gas in the Medicine Hat sand, three were abandoned not having found oil production, and the fourth was capped as a gas well.

No further exploration occurred until recently when, between April 13th and June 16th, 1951, a project of six test wells to test the Medicine Hat gas horizon over a block of 312,213 acres in the Many Island Lake Area was completed and resulted in the delineation of a gas reserve of considerable magnitude.

The wells were drilled for the joint account of Deep Rock Oil Corporation, of Tulsa, and Britalta Petroleums Limited. The acreage is contained within Townships 13, 14, 15, 16 and 17, in Ranges 1, 2, 3 and 4, West of the 4th Meridian, and lies northeast of Medicine Hat

between the Saskatchewan River and the East boundary of the Province. The map with this report shows the boundaries of the Reservations. That should rather be "The map with this report shows the boundaries of the block of reservations."

Q Of the block of reservations?

A Yes, sir.

Q And the map you have reference to follows page 6?

A Follows page 6.

Q Yes.

A <u>THE MEDICINE HAT GAS HORIZON:</u>

The Medicine Hat City gas field lying west of the acreage has been producing gas for many years from a sandy development in the upper part of the Colorado Shale, andis known as the Medicine Hat gas sand. It is encountered at a depth of about 1,200 feet.

The sand occurs with remarkable uniformity over the Medicine Hat City's Reservation and was also encountered containing gas and with identical character 20 miles to the east in the early wells drilled for oil at Many Island Lake. Britalta's holdings were selected and four exploratory wells were located to prove the continuity of the gas-bearing sand in the intervening area between these two developments. Wells Nos. 1, 2, 3, and 4 have amply proven this.

In a Table at the back of the Report, following the map, are data showing the information in respect of these four wells in detail. There are two

pages, but they are both part of the same Table.

Wells Nos. 5 and 6 were located in northerly positions since information was also required in regard to the north limiting boundaries of the gas accumulations. These two wells indicate that the area in which commercial gas occurs is surrounded by a wide marginal region in which the wells yield gas but at rates less than 500,000 cubic feet per day. Examination of the drill samples and electric logs shows that the gas field is limited by a gradually decreasing porosity and permeability, which is due to inter-granular clay clogging the pores, and to a continuing increase of the ratio of clay to sand within the pay horizon. This conforms with information obtained by others on the west, south and southeast of the gas field. Hence we may conclude that the Many Island Lake Gas Field is one continuous blanket deposition of gas-bearing sand, having a porous and permeable inner area surrounded by a band continually decreasing in permeability. The outer band, while not giving flow rates sufficiently high to support commercial wells (as presently completed) does form a reserve of gas, which, with the reduction of pressure by production, will flow inward and replenish to a greater or less degree the commercial gas area. No water was encountered in the gas sand in any of the wells.

SAND THICKNESS:

The sand has a thickness of 24 feet or better in wells Nos. 1, 2, 3 and 4, but because of

observed shale breaks in the middle and bottom of the sand core, it is assumed to have a porous section of 20 feet. It is difficult to obtain a close measurement of the sand thickness in wells Nos. 5 and 6. It is estimated at 15 feet.

SAND POROSITY:

The average weighted porosity as measured for 20 feet of sand core in well No. 3 is 11 per cent, which is used for the calculations of reserves in the commercial gas area. The porosity of the sand in the sub-commercial area is estimated at 7 per cent.

PERMEABILITY:

The permeability for the 20 feet in well No. w core ranges from .1 to 32 millidarcys and has an average of about 9.0 millidarcys.

CONNATE WATER:

The connate water content of the cores was not determined, but assumed to be 20 per cent.

CLOSED OR ROCK PRESSURE:

The well head pressure measured by spring gauge was in excess of 560, that is p.s.i.g., but is taken as 560 p.s.i.g. until more precise gauging is done. The formation pressure (1,400 feet average depth) is calculated at 591 p.s.i.a, for a calculated formation temperature of 58° F.

AREA OF COMMERCIAL GAS - (SEE MAP)

The commercial gas area is defined as the area in which gas wells of 1,000,000 cubic feet per day or more are to be expected. The boundary of the commercial gas area as shown on the map with this submission is based on a correlation of local and regional data. The area within the boundary is estimated at 260 sections.

AREA OF SUB-COMMERCIAL GAS - (SEE MAP)

The sub-commercial gas area is defined as the area in which wells of less than 1,000,000 cubic feet per day open flow are to be expected. The circumscribing boundary is indicated on the map as a possible limit and some 161 sections are estimated to be included therein.

CALCULATION OF RESERVES:

The six wells drilled, together with the information obtained from the earlier drilled wells at Many Island Lake, have proven the extension of the blanket sand eastward from the already developed Medicine Hat City Field. Known sub-surface information has rendered sufficient data, in our opinion, to permit the delineation of a commercial gas area as well as indicating a broad extent of sub-commercial accumulation.

RESERVES TO ZERO PRESSURE:

COMMERCIAL AREA - (260 sections)

$$43{,}560 \times 640 \times 20 \times .11 \times .80 \times 40.04 \times \frac{520}{518} \times \frac{1}{.93}$$

= 2,120,800,000 cubic feet per section

260 x 2,120,800,000 = 551 billion c.f.

SUB-COMMERCIAL AREA - (161 SECTIONS)

$43,560 \times 640 \times 15 \times .07 \quad .80 \times 40.04 \times \frac{520}{518} \times \frac{1}{.93}$

= 1,012,000,000 cubic feet per section

161 x 1,012,000,000 = 163 billion c.f.

TOTAL GAS TO ZERO PRESSURE:

551 + 163 = 714 billion c.f.

RESERVES TO 100 POUNDS PRESSURE:

COMMERCIAL AREA - (260 SECTIONS)

2,120,800,000 - 314,600,000 = 1,806,200,000 c.f. per section.

1,806,200,000 x 260 = 470 billion c.f.

SUB-COMMERCIAL AREA - (161 SECTIONS)

1,012,000,000 - 150,100,000 = 861,900,000 c.f.per section

861,900,000 x 161 = 139 billion c.f.

TOTAL GAS TO 100 POUNDS PRESSURE:

470 + 139 = 609 Billion c.f.

Obviously the withdrawal of gas from the commercial area will cause the migration of gas into it from the sub-commercial area. This migration will tend to sustain the pressure in the commercial area. It is our opinion that more gas will be produced from

the commercial area down to 100 psi, than is indicated by the reserve calculation for that area.

Q Anything to add?

A That is the end of the submission. There are, as probably already mentioned, a map and a Table showing the well data, and another Table showing the gas reserve data.

Q That is all I have. I have not any further questions.

(Go to page 941)

THE CHAIRMAN: Does anyone have any questions of Mr. Slipper?

MR. S. B. SMITH: I have no questions, sir.

CROSS-EXAMINATION BY MR. STEER:

Q Mr. Slipper, referring to your map . . .

A Yes, sir.

Q . . . how far from the margins of what you call your commercial areas do you think gas will be drawn into the commercial areas?

A I have no way of giving you an intelligent answer to the question. I can only say that there will be some gas come in.

Q And is that the way in which the gas in the sub-commercial area is going to be developed, by being drawn into the commercial area?

A Yes, that is the way in which, as I tried to say in the last paragraph, that the gas will come from the sub-commercial area into the commercial area as pressure drops. There will be a pressure gradient into the low pressure sink that will develop but that is as far as I can go.

Q Would you contemplate drilling wells in what you call your sub-commercial area if you are going to get wells 250,000 Mcf to a million Mcf?

A No, not with the present methods of drilling and the present costs. There may be sometime in the future that that will be called commercial.

Q And I suppose depending on the price of gas at that time?

A That is right.

S.E. Slipper,
Cr. Ex. by Mr. McDonald.

CROSS-EXAMINATION BY MR. McDONALD:

Q Do I understand you, Mr. Slipper, that on the basis of the four wells drilled you allocate 260 sections commercial?

A Yes, sir. Four wells drilled and development in each end.

Q Yes, and your area is approximately 10 miles wide by about 24 miles long?

A Yes.

Q I am only speaking of the commercial proved?

A Yes.

Q You use the word "commercial"?

A I used the word "commercial".

Q And have you any comment, Mr. Slipper, on well No. 4? I note that the flow test is 1100 Mcf per day?

A That is right. 1100 is near the marginal edge.

Q MR. STEER: Your estimate with regard to this field, Mr. Slipper, your judgment was not based only on those four wells?

A Oh, no. There is quite a lot of geological information.

Q You had all the geological information on the Medicine Hat field?

A Yes.

Q And you had the four wells drilled in the vicinity, all of which were producing gas wells?

A That is right.

Q And you had information as to the continuity of the sand, is that right?

A That is right.

Q And the fact that the sand was laid down more or less level?

A Yes, more or less of a uniform sand, the type of sedimentation which is a sand bar and gave me security in feeling that I should take that acreage in order to prospect it outwards from Medicine Hat and inwards from Many Islands Lake.

MR. PORTER: Mr. Chairman, I may have a question or two later from Mr. Slipper which I am unable to put at the moment because the subject is under study. I would like it understood that Mr. Slipper may come back at some convenient time for me to ask them.

MR. CHAMBERS: Mr. Slipper will be available on any reasonable notice.

MR. C. E. SMITH: I thought he wanted to get away, myself.

MR. CHAMBERS: No, he said some time in the future.

MR. C. E. SMITH: I have nothing. I may have if he does come back.

Q DR. GOVIER: Mr. Slipper, are the two areas, the 260 and the 160 area you have discussed, are they both totally enclosed within the boundaries of the block of reservations?

A Yes, sir, but the 160 acres of non-commercial area . . .

Q MR. STEER: Sections?

A 160 sections, yes, thanks. I did include that area that you will see in Township 15.

Q DR. GOVIER: 15 did you say?

A In Township 15, yes. There is an area there which I have included in the 161 sections in making my reserve estimates. So that in that respect that part of the

non-commercial area is not in Britalta's holdings.

Q MR. C. E. SMITH: The same with Township 12, a portion of it?

A Yes, that is right.

Q Dr. GOVIER: Mr. Slipper, would it be reasonable to apply the same acre-foot reserve as you have obtained in these areas to the other portions of the field or has your study gone that far?

A For instance, you mean to Medicine Hat?

Q Yes?

A I think it would but I have not studied it.

Q And I am still not sure whether you include as part of the sub-commercial area that part that is shown dotted on the map along below or to the south of your commercial area. Is that included in the 160-odd sections?

A I do not think it is, no. Just the northern part. It was more or less out of our reservation so we did not include it.

Q And all of the commercial area which you have estimated is within the block?

A Is within the block, yes, sir.

Q Thank you very much.

Q MR. STEER: That southern line is marked "Possible limits, sub-commercial gas area", Mr. Slipper?

A Yes, I did not include it with the 161 sections.

Q Oh, I see.

Q MR. CHAMBERS Am I right in this, that the block in the upper right-hand side . . .

A Yes, in Township 15, Range 1.

Q . . . is included in your estimates?

A That is included in the estimates.

Q But the part, the non-commercial area to the south of this area, is not included?

A That is right.

Q MR. C. E. SMITH: Mr. Slipper, just one question. Are your section numbers only within your table line showing your reservation, is that correct?

A Yes, that is right. No, this sub-commercial area, the northern part of it, the 161 sections, includes also that block that is outside on the right-hand side of the map in Township 15, Range 1. That is also included.

Q O.K. I was looking at the wrong side. Thanks.

Q MR. GOODALL: Your pressures in the field, you just give one pressure over the whole area?

A Over the whole area, yes.

Q It was not weighted?

A No, it was not weighted?

Q Was there much difference in the pressure between the west side of the block and the commercial area? I suppose you have not got any record?

A No, I haven't any record of those west and east wells.

Q Do you think they are very nearly original?

A Yes. I will tell you what our spring gauge readings were. They varied from 560 to 565 pounds. Since I do not put much reliance on the precision of the spring gauge I am waiting until I can get some dead-weight pressure gauge measurements.

Q That is all the difference you had between the different

S.E. Slipper,
Exam. by Mr. Goodall.

wells?

A That is right.

Q It would appear then that the migration has not been too rapid from the commercial area into the City of Medicine Hat?

A So far as pressure, sir, there has been no migration.

Q Thank you.

THE CHAIRMAN: We will now adjourn.

(The Hearing then adjourned until 9 A.M. September 27, 1951.)

The Province of Alberta

PETROLEUM AND NATURAL GAS CONSERVATION BOARD

Application for Permission to Remove or cause to be removed Natural Gas from the Province of Alberta, under the Provisions of the Gas Resources Preservation Act by Prairie Pipe Lines Limited.

I. N. McKinnon Esq., Chairman

D. P. Goodall Esq.

Dr. G. W. Govier

Session:

Volume_____